

FIG. 1

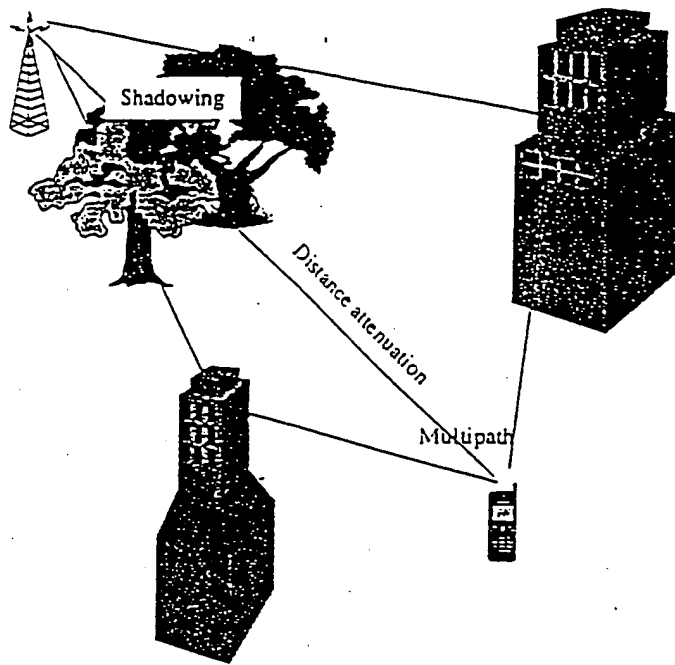


FIG. 2

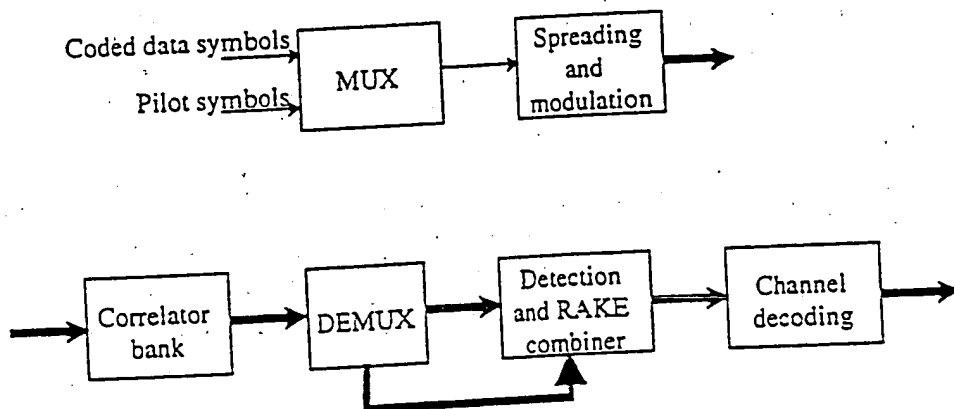
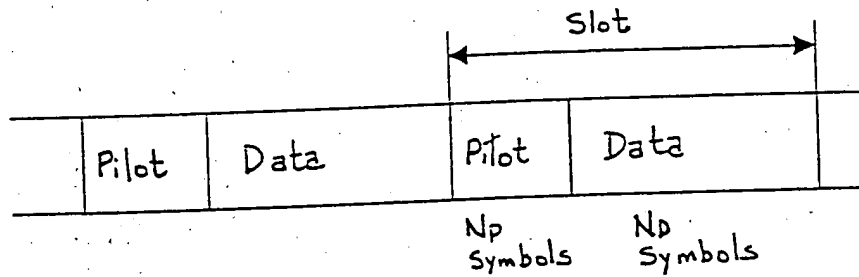


FIG. 3

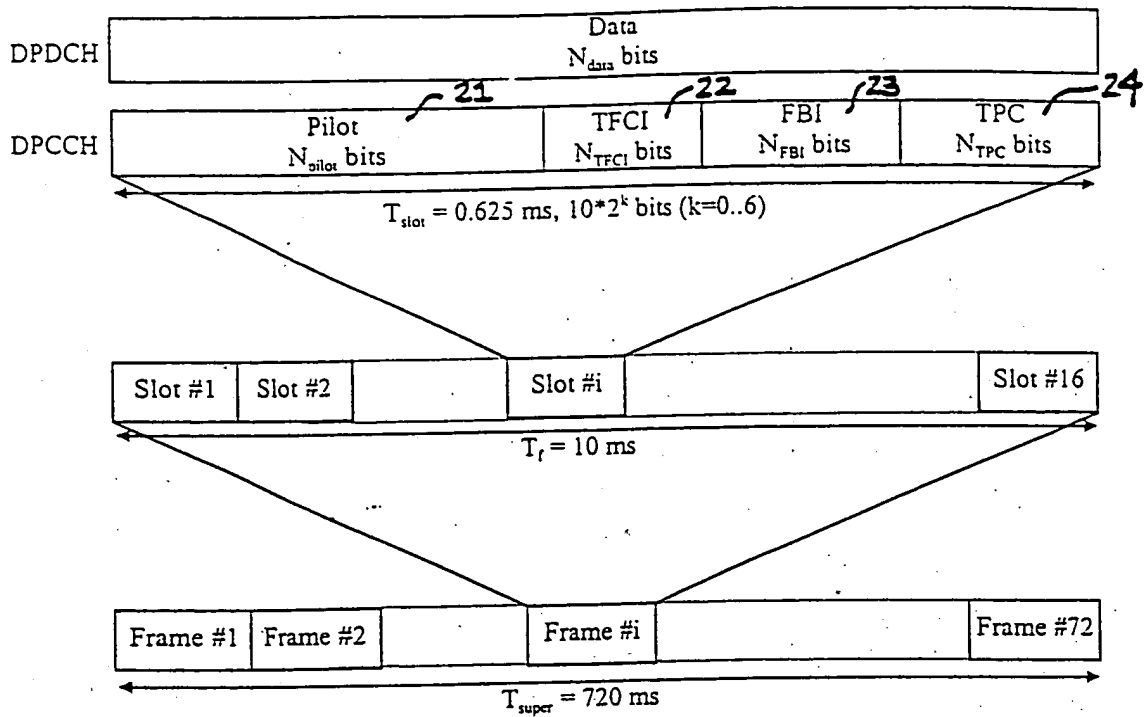


FIG. 4

Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	$N_{pilot}$	$N_{TPC}$	$N_{TFCI}$	$N_{FBI}$
16	16	256	160	10	6	2	2	0
16	16	256	160	10	8	2	0	0
16	16	256	160	10	5	2	2	1
16	16	256	160	10	7	2	0	1
16	16	256	160	10	[6]	[2]	[0]	[2]
16	16	256	160	10	[5]	[1]	[2]	[2]

FIG. 5

	$N_{\text{pilot}} = 6$						$N_{\text{pilot}} = 8$							
Bit #	0	1	2	3	4	5	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	0	1	1	1	1	1	0	1	1	1
3	1	0	1	1	0	1	1	0	1	1	0	1	1	1
4	1	1	0	1	0	1	1	1	0	1	0	1	1	1
5	1	1	0	1	1	1	1	1	0	1	1	1	1	1
6	1	1	0	1	1	1	1	1	0	1	1	1	1	1
7	1	0	1	1	0	0	1	0	1	1	0	1	0	0
8	1	1	0	1	0	1	1	1	0	1	0	1	1	1
9	1	1	1	1	0	0	1	1	1	1	0	1	0	0
10	1	0	1	1	0	1	1	0	1	1	0	1	1	1
11	1	1	1	1	1	0	1	1	1	1	1	1	0	0
12	1	0	1	1	0	1	1	0	1	1	0	1	1	1
13	1	0	0	1	0	1	1	0	1	0	1	0	1	1
14	1	1	0	1	0	0	1	1	0	1	0	1	0	0
15	1	0	1	1	0	0	1	0	1	1	0	1	0	0
16	1	0	0	1	0	0	1	0	1	0	1	0	1	0

FIG. 6

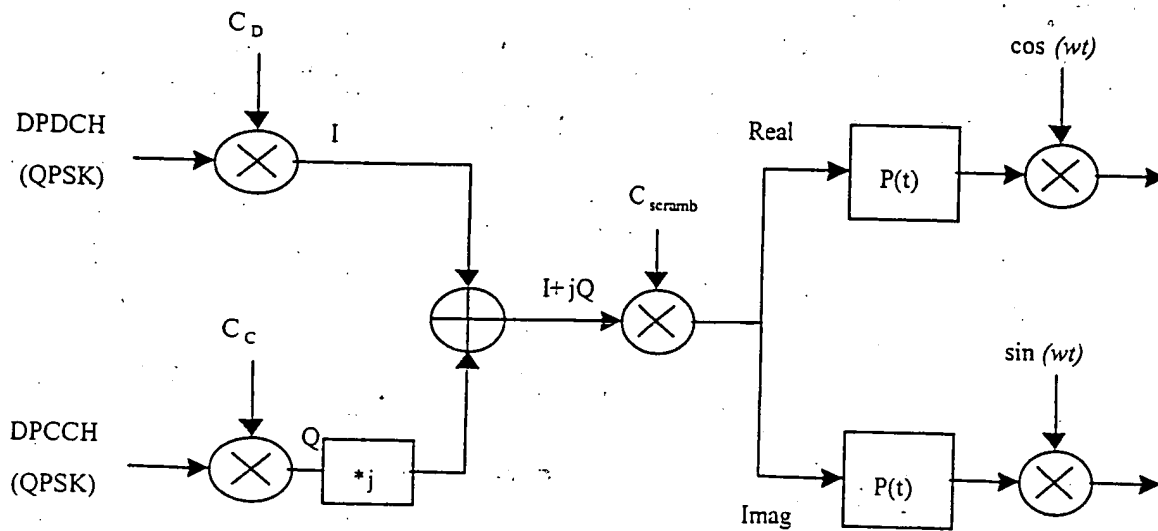


FIG. 7

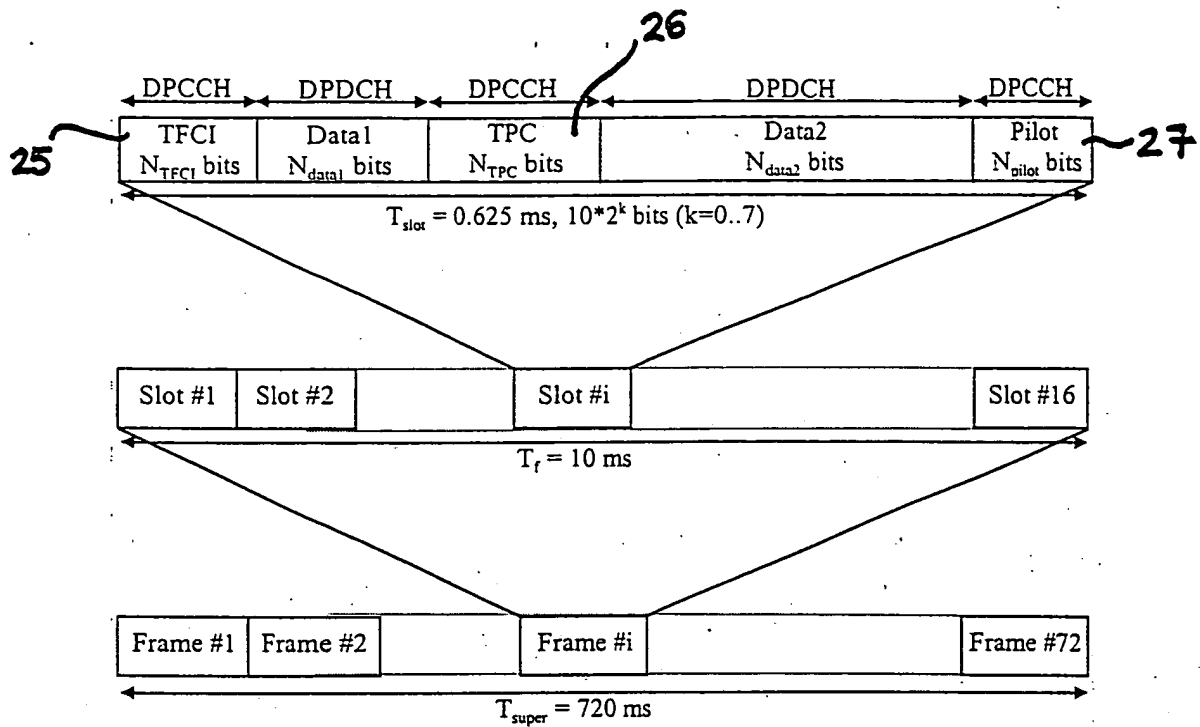
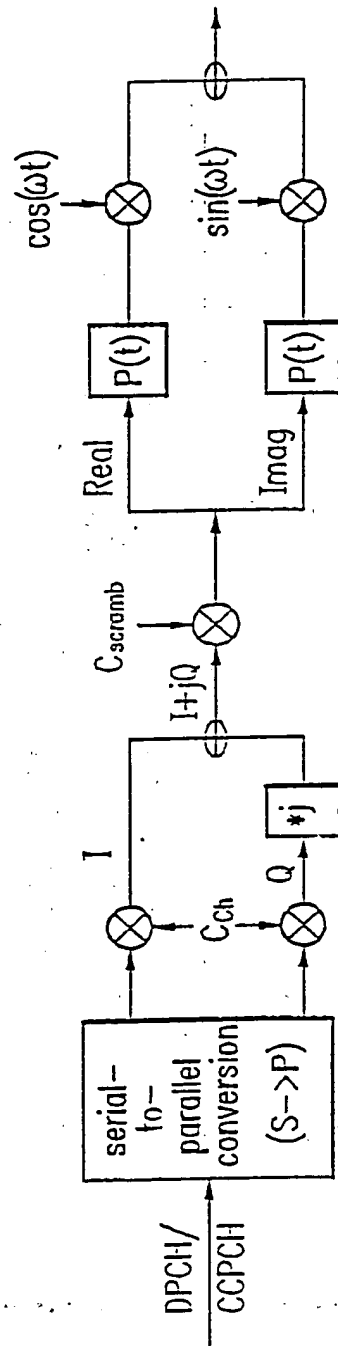


FIG. 8

Symbol rate	8ksps				16,32,64,128ksps				256,512,1024ksps							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7		
Slot # 1	11	11	11	11	11	11	11	11	11	11	11	11	11	10		
2	11	11	11	11	11	01	11	10	11	10	11	10	11	01		
3	11	10	11	01	11	01	11	10	11	01	11	11	11	01		
4	11	01	11	10	11	01	11	11	11	01	11	00	11	10		
5	11	10	11	10	11	11	11	11	11	00	11	01	11	10		
6	11	10	11	10	11	11	11	11	11	11	11	01	11	10		
7	11	01	11	01	11	00	11	10	11	11	11	01	11	10		
8	11	00	11	10	11	01	11	01	11	00	11	10	11	00		
9	11	00	11	11	11	00	11	11	11	10	11	00	11	01		
10	11	10	11	01	11	01	11	01	11	11	11	11	11	00		
11	11	10	11	11	11	10	11	10	11	10	11	11	11	10		
12	11	11	11	01	11	01	11	01	11	10	11	10	11	00		
13	11	10	11	00	11	01	11	10	11	01	11	11	11	10		
14	11	11	11	10	11	00	11	00	11	10	11	10	11	00		
15	11	00	11	01	11	00	11	01	11	10	11	00	11	00		
16	11	00	11	00	11	00	11	10	11	00	11	00	11	00		

FIG. 9

FIG. 10



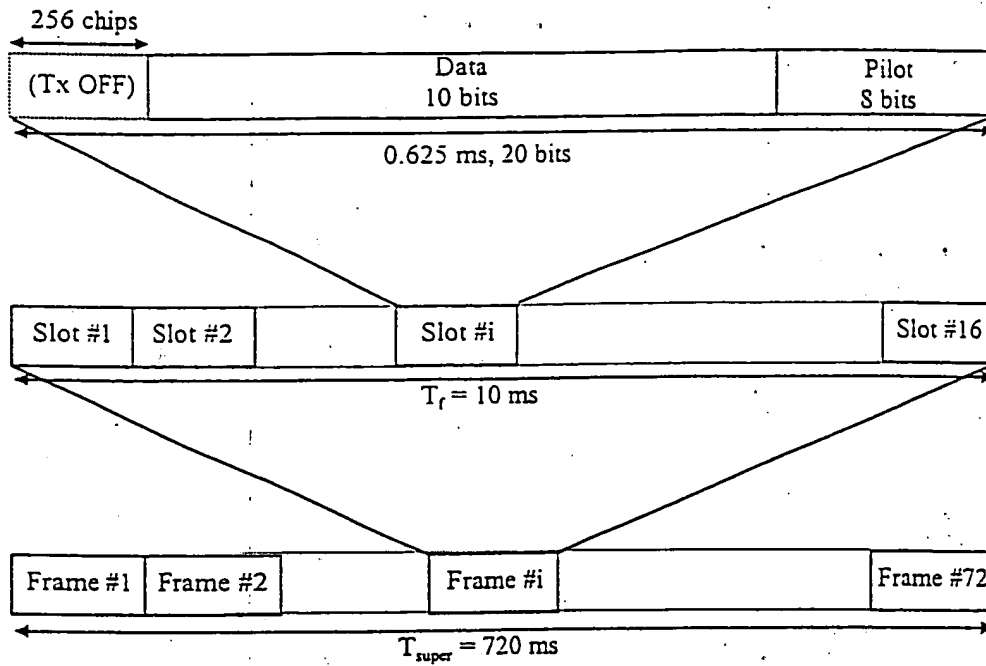


FIG. 11A

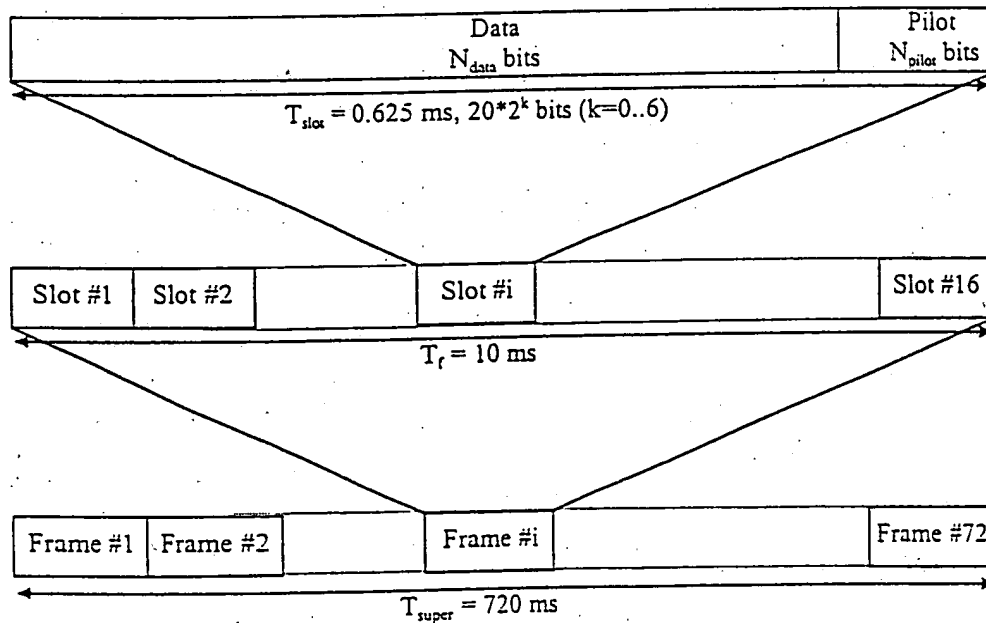


FIG. 11B

Frame Synchronization Words																
Slot Number	1	2	3	4	5	.....	L									
	$C_1=(1101111100100000)$															
	$C_2=(1000101001110101)$															
	$C_3=(1101110000100011)$															
	$C_4=(0111011010001001)$															
	$C_5=(1011000001001111)$															
	$C_6=(1110010100011010)$															
	$C_7=(0100001110111100)$															
	$C_8=(1110100100010110)$															

FIG. 12A

$R(\tau)$	$\tau$	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$R_E(\tau)$		16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
$R_F(\tau)$		16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
$R_G(\tau)$		16	4	0	-4	0	4	0	-4	-16	-4	0	4	0	-4	0	4
$R_H(\tau)$		16	-4	0	4	0	-4	0	4	-16	4	0	-4	0	4	0	-4

$R_1$ 
 $R_2$

FIG. 12B



$(R_E(\tau) + R_F(\tau)), \text{ or } (R_G(\tau) + R_H(\tau))$

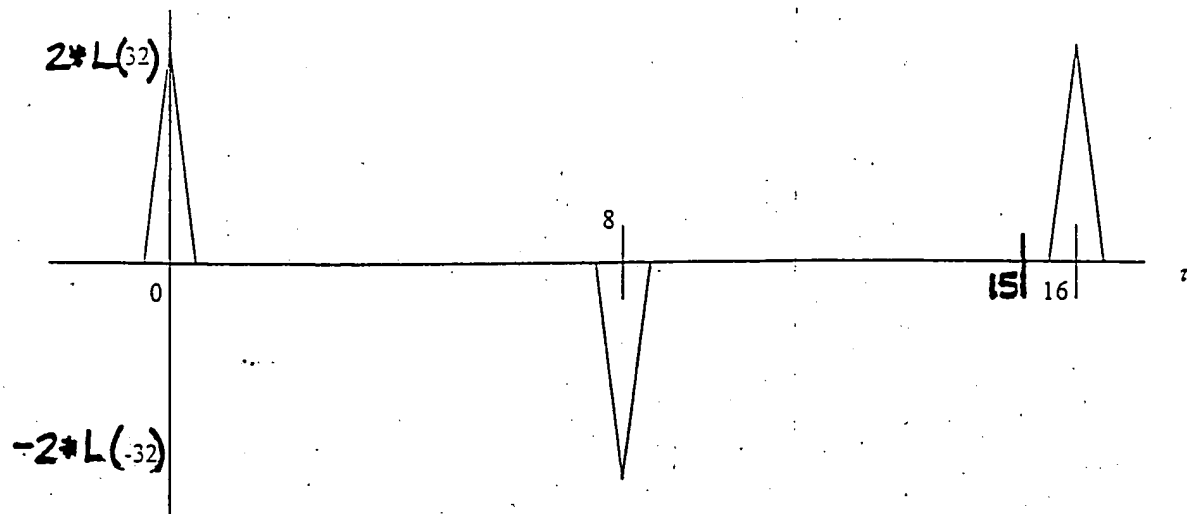


FIG. 13A

$R_E(\tau) + R_F(\tau) + R_G(\tau) + R_H(\tau)$

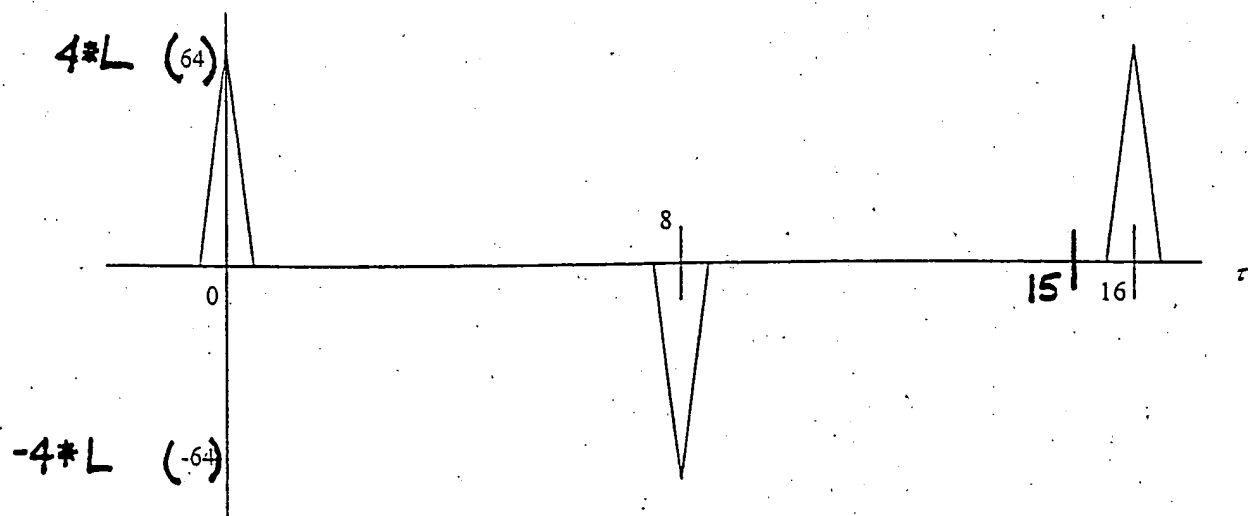


FIG. 13B

	$N_{pilot} = 5$					$N_{pilot} = 6$				
Bit #	0	1	2	3	4	0	1	2	3	4
Slot #1	1	0	1	1	0	1	1	1	1	0
2	1	0	1	1	1	1	1	0	1	1
3	0	0	1	0	1	1	0	0	1	0
4	1	0	1	1	1	1	1	0	1	1
5	1	1	1	1	0	1	1	1	1	0
6	1	0	1	1	1	1	1	0	1	1
7	1	1	1	0	1	1	1	1	1	0
8	1	0	1	0	0	1	1	0	1	0
9	0	0	1	0	1	1	0	0	1	0
10	0	1	1	0	0	1	0	1	1	0
11	1	1	1	1	0	1	1	1	1	0
12	0	1	1	0	0	1	0	1	1	0
13	0	0	1	0	1	1	0	0	1	0
14	0	1	1	0	0	1	0	1	1	0
15	0	0	1	1	0	1	0	0	1	0
16	0	1	1	1	1	1	0	1	1	1

FIG. 14A

FIG. 14A

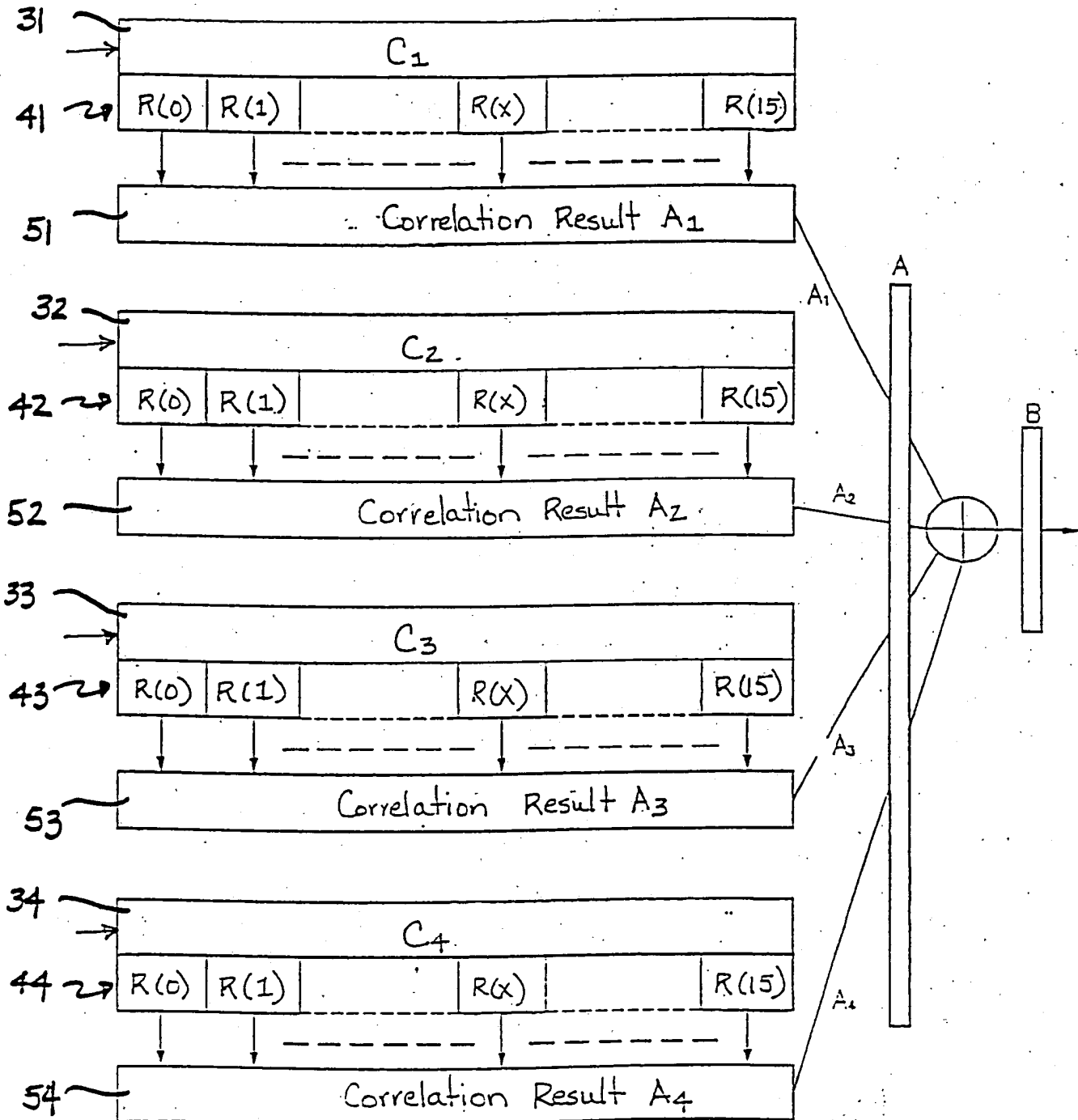
	$N_{pilot} = 7$							$N_{pilot} = 8$							
Bit #	0	1	2	3	4	5	6	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
2	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
3	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
4	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
5	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
6	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
7	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1
8	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
9	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
10	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
11	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
12	1	0	1	1	0	0	1	1	0	1	0	1	0	1	0
13	1	0	0	1	0	1	1	1	0	1	0	1	0	1	1
14	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0
15	1	0	0	1	1	0	1	1	0	1	0	1	1	1	0
16	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1

FIG. 14B

$N_{\text{pilot}}$	Pilot bit position #	Corresponding word of length 16
5	0	$C_1$
	1	$C_2$
	3	$C_3$
	4	$C_4$
6	1	$C_1$
	2	$C_2$
	4	$C_3$
	5	$C_4$
7	1	$C_1$
	2	$C_2$
	4	$C_3$
	5	$C_4$
8	1	$C_1$
	3	$C_2$
	5	$C_3$
	7	$C_4$

FIG. 14C

FIG. 14D



	$R_x$ (0)	$R_x$ (1)	$R_x$ (2)	$R_x$ (3)	$R_x$ (4)	$R_x$ (5)	$R_x$ (6)	$R_x$ (7)	$R_x$ (8)	$R_x$ (9)	$R_x$ (10)	$R_x$ (11)	$R_x$ (12)	$R_x$ (13)	$R_x$ (14)	$R_x$ (15)
A <sub>1</sub> POINT	16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
A <sub>2</sub> POINT	16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
A <sub>3</sub> POINT	16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
A <sub>4</sub> POINT	16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
B POINT	64	0	0	0	0	0	0	0	-64	0	0	0	0	0	0	0

FIG. 14E

	$R_x$ (0)	$R_x$ (1)	$R_x$ (2)	$R_x$ (3)	$R_x$ (4)	$R_x$ (5)	$R_x$ (6)	$R_x$ (7)	$R_x$ (8)	$R_x$ (9)	$R_x$ (10)	$R_x$ (11)	$R_x$ (12)	$R_x$ (13)	$R_x$ (14)	$R_x$ (15)
A <sub>1</sub> POINT +A <sub>2</sub> POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0
A <sub>3</sub> POINT +A <sub>4</sub> POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0
A <sub>1</sub> POINT +A <sub>4</sub> POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0
A <sub>2</sub> POINT + A <sub>3</sub> POINT	32	0	0	0	0	0	0	0	-32	0	0	0	0	0	0	0

FIG. 14F

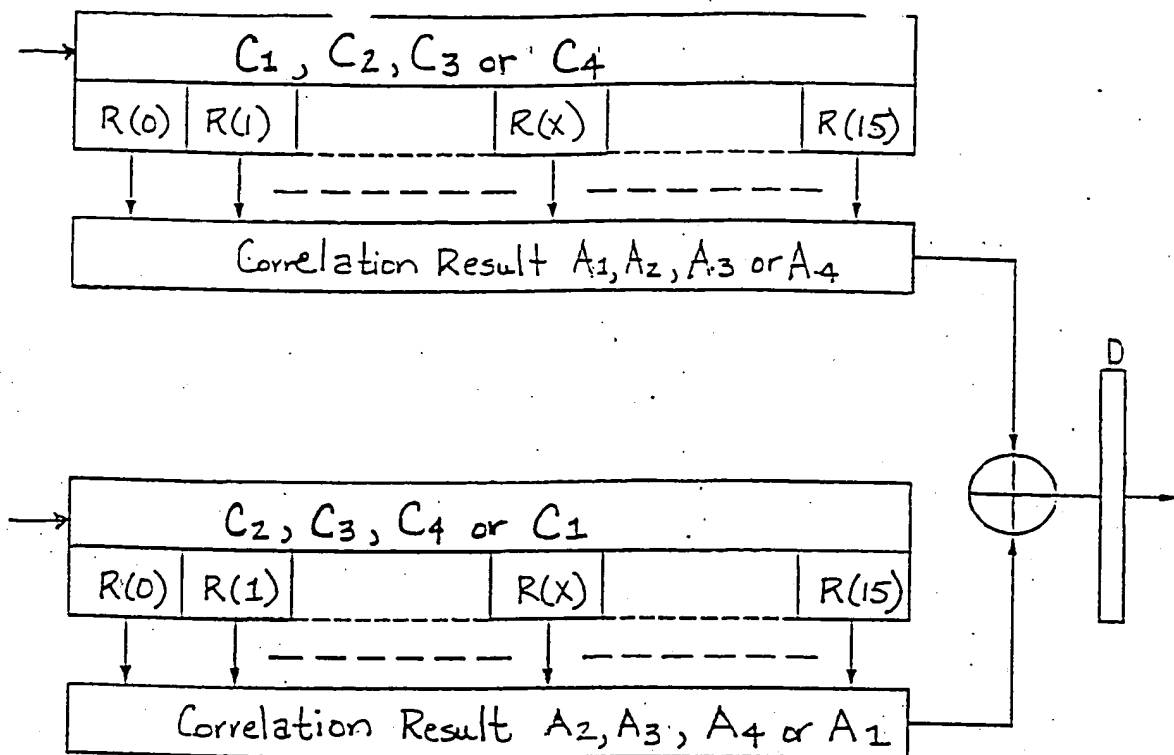


FIG. 14G

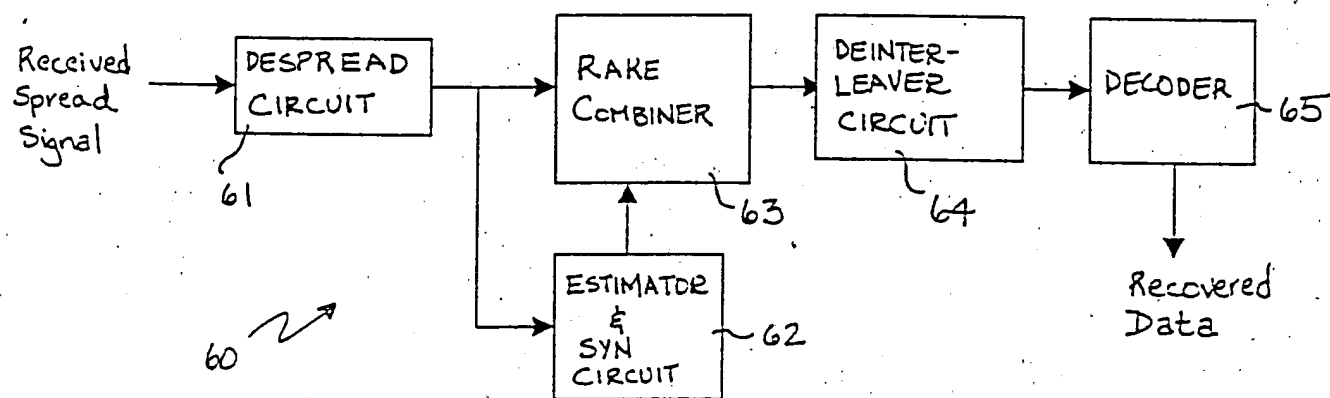


FIG. 14H

FIG. 14I

	$R_x$ (0)	$R_x$ (1)	$R_x$ (2)	$R_x$ (3)	$R_x$ (4)	$R_x$ (5)	$R_x$ (6)	$R_x$ (7)	$R_x$ (8)	$R_x$ (9)	$R_x$ (10)	$R_x$ (11)	$R_x$ (12)	$R_x$ (13)	$R_x$ (14)	$R_x$ (15)
A <sub>1</sub> POINT	16	-4	-4	8	0	-4	0	0	-4	0	0	-4	0	8	-4	-4
A <sub>2</sub> POINT	16	0	0	-4	-4	-4	0	0	12	0	0	-4	-4	-4	0	0
A <sub>3</sub> POINT	16	4	0	0	4	8	8	0	0	0	8	8	4	0	0	4
A <sub>4</sub> POINT	16	0	4	-4	0	0	-4	4	0	4	-4	0	0	-4	4	0
B POINT	64	0	0	0	0	0	4	4	8	4	4	0	0	0	0	0

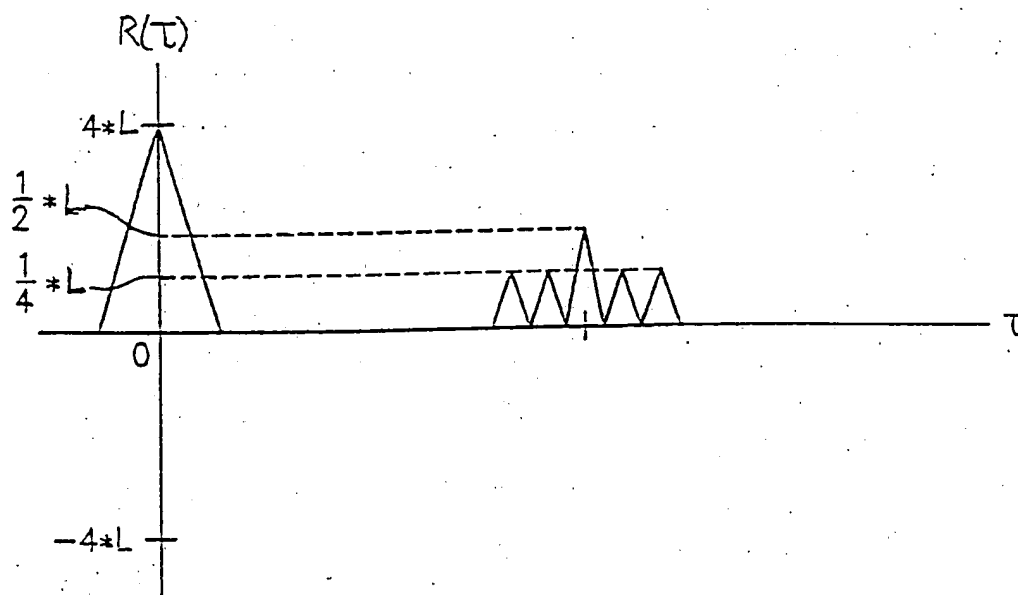


FIG. 14J



	$N_{pi} = 4$		$N_{pilot} = 8$				$N_{pilot} = 16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	11	11	10	11	11	11	10	11	11	11	01
2	11	10	11	10	11	11	11	10	11	11	11	01	11	11
3	11	00	11	00	11	01	11	00	11	01	11	11	11	01
4	11	10	11	10	11	11	11	10	11	11	11	10	11	00
5	11	11	11	11	11	10	11	11	11	10	11	00	11	01
6	11	10	11	10	11	11	11	10	11	11	11	01	11	00
7	11	11	11	11	11	01	11	11	11	01	11	00	11	10
8	11	10	11	10	11	00	11	10	11	00	11	01	11	11
9	11	00	11	00	11	01	11	00	11	01	11	00	11	10
10	11	01	11	01	11	00	11	01	11	00	11	10	11	00
11	11	11	11	11	11	10	11	11	11	10	11	00	11	10
12	11	01	11	01	11	00	11	01	11	00	11	01	11	11
13	11	00	11	00	11	01	11	00	11	01	11	11	11	10
14	11	01	11	01	11	00	11	01	11	00	11	10	11	11
15	11	00	11	00	11	10	11	00	11	10	11	11	11	01
16	11	01	11	01	11	11	11	01	11	11	11	10	11	00

FIG. 15A

Symbol rate	Symbol #	Channel	Corresponding word of length $L=16$
$N_{pilot} = 4$	1	I-CH	$C_1$
		Q-CH	$C_2$
$N_{pilot} = 8$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
$N_{pilot} = 16$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
	5	I-CH	$C_5$
		Q-CH	$C_6$
	7	I-CH	$C_7$
		Q-CH	$C_8$

FIG. 15B

FIG 15C

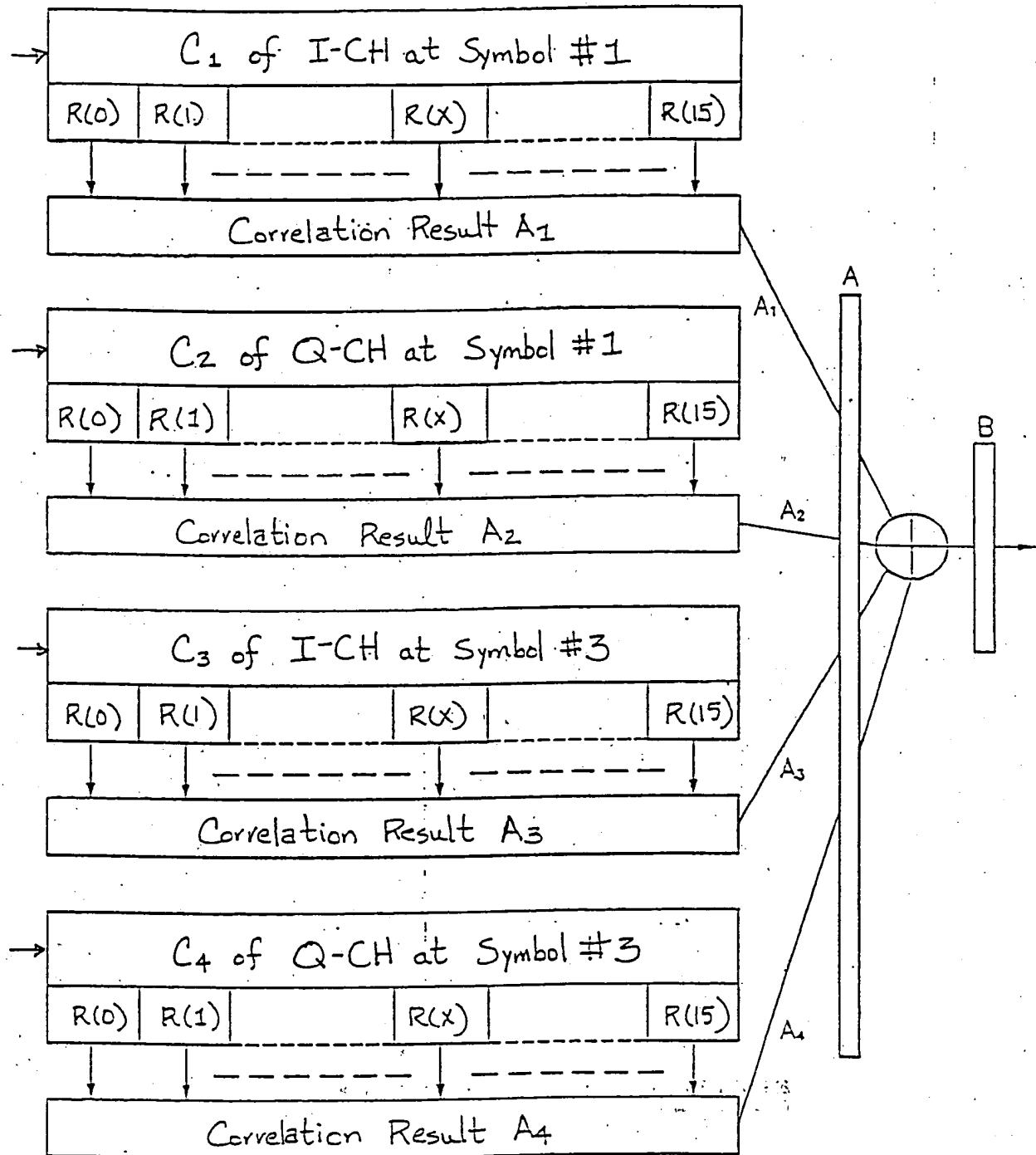


FIG. 16A

Symbol #	0	1	2	3
Slot #1	11	11	11	10
2	11	10	11	11
3	11	00	11	01
4	11	10	11	11
5	11	11	11	10
6	11	10	11	11
7	11	11	11	01
8	11	10	11	00
9	11	00	11	01
10	11	01	11	00
11	11	11	11	10
12	11	01	11	00
13	11	00	11	01
14	11	01	11	00
15	11	00	11	10
16	11	01	11	11

FIG. 16B

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C <sub>1</sub>
	Q-CH	C <sub>2</sub>
3	I-CH	C <sub>3</sub>
	Q-CH	C <sub>4</sub>

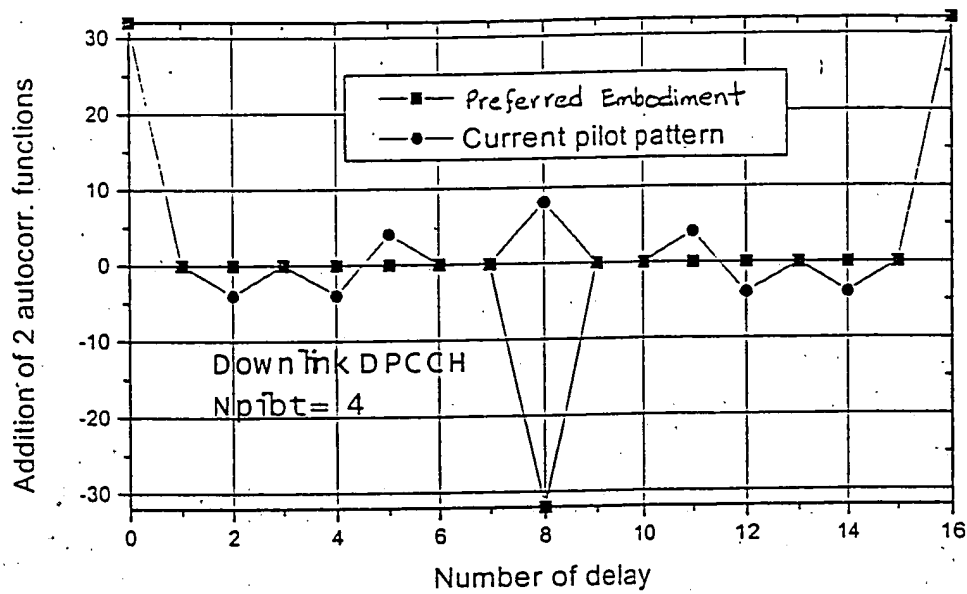
	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 1$							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	10	11	11	11	10	11	11	11	01
2	11	10	11	11	11	10	11	11	11	01	11	11
3	11	00	11	01	11	00	11	01	11	11	11	01
4	11	10	11	11	11	10	11	11	11	10	11	00
5	11	11	11	10	11	11	11	10	11	00	11	01
6	11	10	11	11	11	10	11	11	11	01	11	00
7	11	11	11	01	11	11	11	01	11	00	11	10
8	11	10	11	00	11	10	11	00	11	01	11	11
9	11	00	11	01	11	00	11	01	11	00	11	10
10	11	01	11	00	11	01	11	00	11	10	11	00
11	11	11	11	10	11	11	11	10	11	00	11	10
12	11	01	11	00	11	01	11	00	11	01	11	11
13	11	00	11	01	11	00	11	01	11	11	11	10
14	11	01	11	00	11	01	11	00	11	10	11	11
15	11	00	11	10	11	00	11	10	11	11	11	01
16	11	01	11	11	11	01	11	11	11	10	11	00

FIG. 16C

Symbol rate	Symbol #	Channel	Corresponding word of length 16
$N_{\text{pilot}} = 8$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
$N_{\text{pilot}} = 16$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
	5	I-CH	$C_5$
		Q-CH	$C_6$
	7	I-CH	$C_7$
		Q-CH	$C_8$

FIG. 16D

# FIG. 17A



# FIG 17B

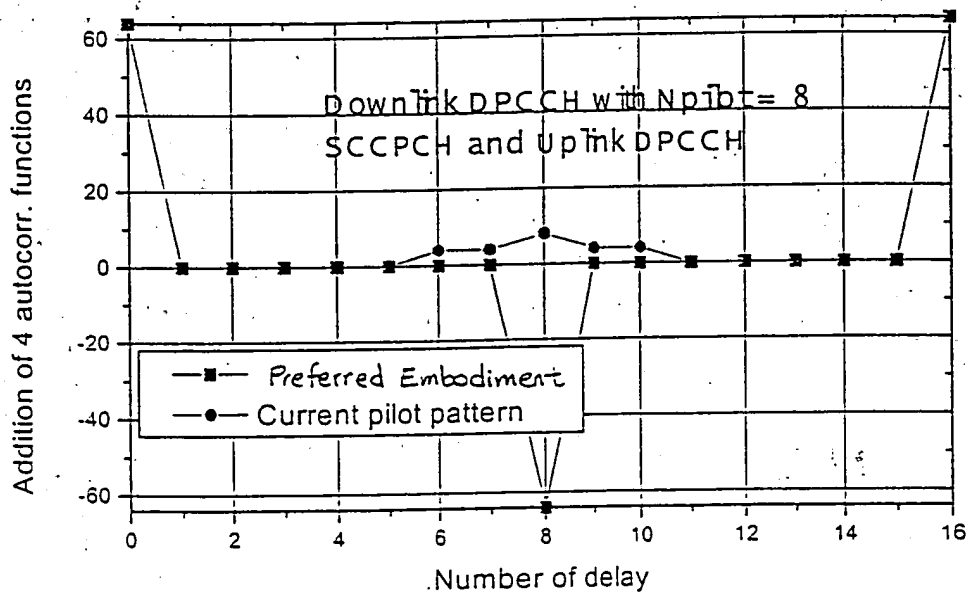
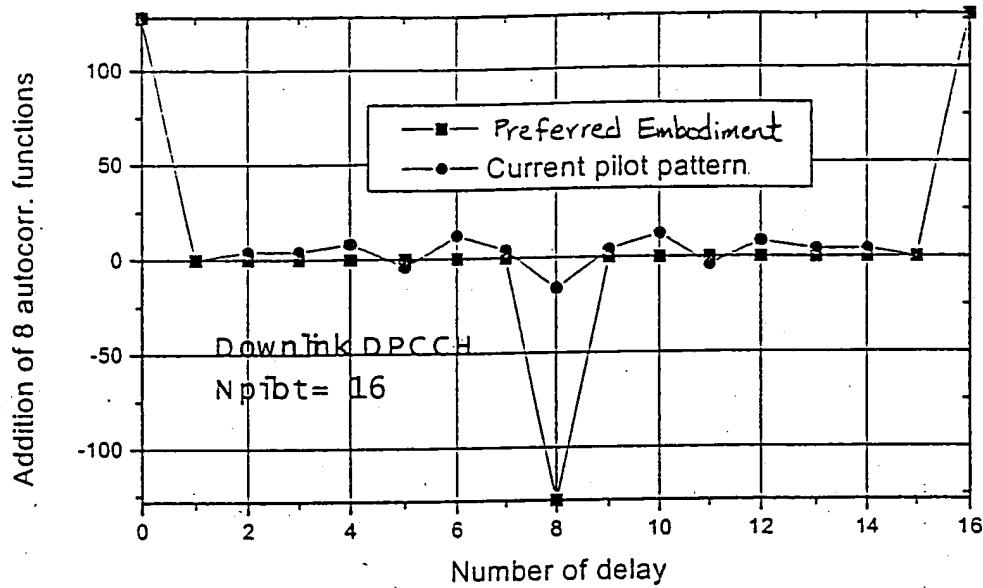


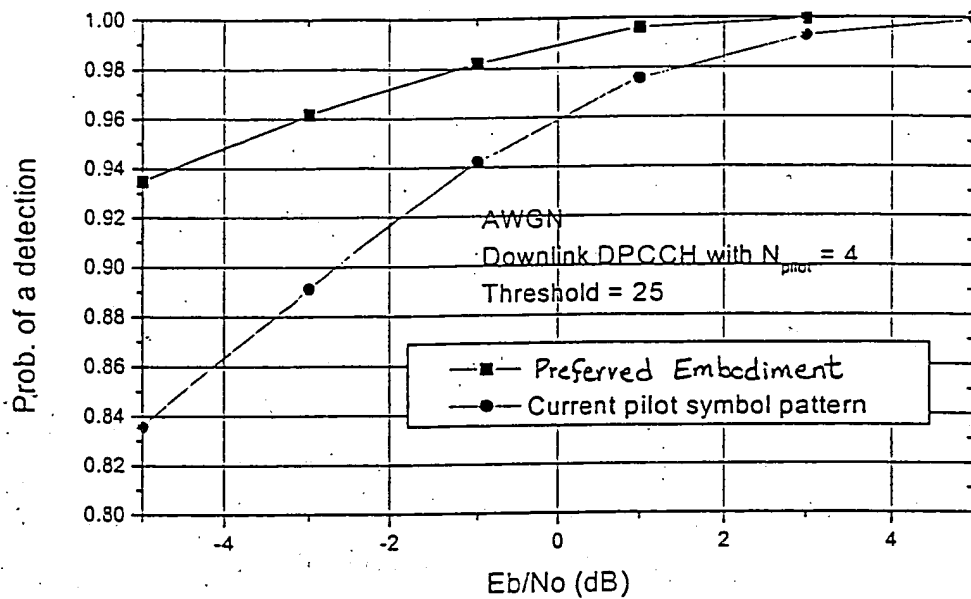
FIG. 17C



Parameters	Downlink
Slot per frame	16
Number of bits in the DPCCH (Pilot/TPC/TFI)	4/2/0
Number of bits in the DPDCH per each slot	4
Spreading factor (DPDCH)	512
Spreading factor (DPCCH)	512
Modulation	QPSK
3dB bandwidth	4.096MHz
Shaping filter	Root raised cosine (roll off 0.22)
Power amplifier	Ideal
Propagation channel	AWGN

FIG. 18A

# FIG. 18B



# FIG. 18C

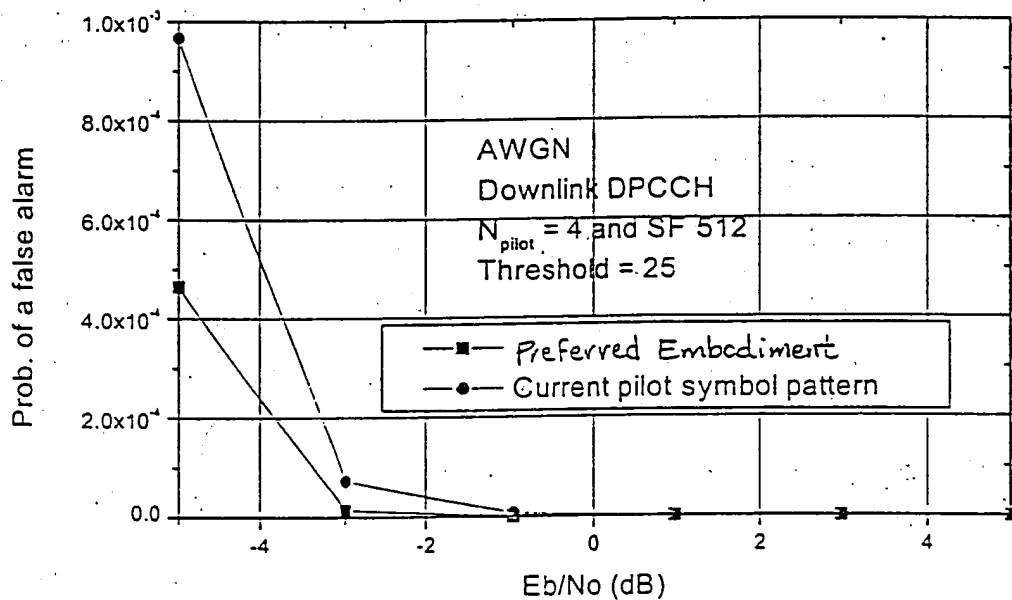
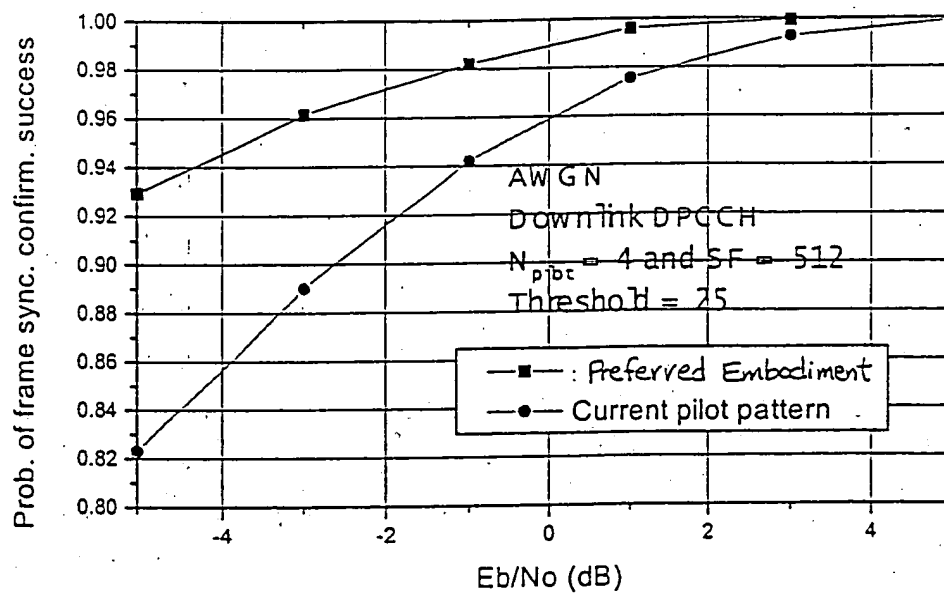


FIG. 18D





	$N_{\text{pilot}} =$		$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	01	10	11	00	00	10	11	00	00	10	11	11	00	10
2	00	10	11	01	00	11	11	01	00	11	11	01	00	00
3	10	10	11	11	00	01	11	11	00	01	11	11	00	10
4	00	10	11	01	00	11	11	01	00	11	11	10	00	11
5	01	10	11	00	00	10	11	00	00	10	11	11	00	01
6	00	10	11	01	00	11	11	01	00	11	11	10	00	00
7	01	10	11	11	00	10	11	11	00	10	11	00	00	01
8	00	10	11	10	00	11	11	10	00	11	11	01	00	00
9	10	10	11	11	00	01	11	11	00	01	11	00	00	01
10	11	10	11	10	00	00	11	10	00	00	11	10	00	11
11	01	10	11	00	00	10	11	00	00	10	11	00	00	01
12	11	10	11	10	00	00	11	10	00	00	11	01	00	00
13	10	10	11	11	00	01	11	11	00	01	11	00	00	10
14	11	10	11	10	00	00	11	10	00	00	11	01	00	11
15	10	10	11	00	00	01	11	00	00	01	11	11	00	10
16	11	10	11	01	00	00	11	01	00	00	11	10	00	11

FIG. 19A

Symbol rate	Symbol #	Channel	Corresponding word of length 16
$N_{\text{pilot}} = 4$	0	I-CH	$-C_1$
		Q-CH	$C_2$
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	$C_3$
	7	I-CH	$C_5$
		Q-CH	$-C_6$

FIG. 19B

FIG. 19C

Symbol #	0	1	2	3
Slot #1	11	11	00	01
2	11	10	00	00
3	11	00	00	10
4	11	10	00	00
5	11	11	00	01
6	11	10	00	00
7	11	11	00	10
8	11	10	00	11
9	11	00	00	10
10	11	01	00	11
11	11	11	00	01
12	11	01	00	11
13	11	00	00	10
14	11	01	00	11
15	11	00	00	01
16	11	01	00	00

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C <sub>1</sub>
	Q-CH	C <sub>2</sub>
3	I-CH	-C <sub>3</sub>
	Q-CH	-C <sub>4</sub>

FIG. 19D

	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	00	00	10	11	00	00	10	11	11	00	10
2	11	01	00	11	11	01	00	11	11	01	00	00
3	11	11	00	01	11	11	00	01	11	11	00	10
4	11	01	00	11	11	01	00	11	11	10	00	11
5	11	00	00	10	11	00	00	10	11	11	00	01
6	11	01	00	11	11	01	00	11	11	10	00	00
7	11	11	00	10	11	11	00	10	11	00	00	01
8	11	10	00	11	11	10	00	11	11	01	00	00
9	11	11	00	01	11	11	00	01	11	00	00	01
10	11	10	00	00	11	10	00	00	11	10	00	11
11	11	00	00	10	11	00	00	10	11	00	00	01
12	11	10	00	00	11	10	00	00	11	01	00	00
13	11	11	00	01	11	11	00	01	11	00	00	10
14	11	10	00	00	11	10	00	00	11	01	00	11
15	11	00	00	01	11	00	00	01	11	11	00	10
16	11	01	00	00	11	01	00	00	11	10	00	11

FIG. 19E

Symbol rate	Symbol #	Channel	Corresponding word of length 16
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	$C_3$
	7	I-CH	$C_5$
		Q-CH	$-C_6$

FIG. 19F

Sequence	Autocorrelation
$C_1=(1101111100100000)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_2=(1000101001110101)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_3=(1111101100000100)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_4=(0101000110101110)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_5=(0011101111000100)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_6=(0010010111011010)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4
$C_7=(0111000010001111)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_8=(1011101001000101)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4
$C_9=(0011011111001000)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_{10}=(0010100111010110)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_{11}=(1100000100111110)$	16 4 0 4 0 -4 0 -4 -16 -4 0 -4 0 4 0 4
$C_{12}=(1011100101000110)$	16 -4 0 -4 0 4 0 4 -16 4 0 4 0 -4 0 -4
$C_{13}=(0100001110111100)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_{14}=(1000100101110110)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4
$C_{15}=(0000100011110111)$	16 4 0 -4 0 4 0 -4 -16 -4 0 4 0 -4 0 4
$C_{16}=(1001000101101110)$	16 -4 0 4 0 -4 0 4 -16 4 0 -4 0 4 0 -4

FIG. 20A

$R(\tau)$ $\tau$	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
$R_E(\tau)$	16	4	0	4	0	-4	0	-4	-16	-4	0	-4	0	4	0	4
$R_F(\tau)$	16	-4	0	-4	0	4	0	4	-16	4	0	4	0	-4	0	-4
$R_G(\tau)$	16	4	0	-4	0	4	0	-4	-16	-4	0	4	0	-4	0	4
$R_H(\tau)$	16	-4	0	4	0	-4	0	4	-16	4	0	-4	0	4	0	-4

FIG. 20B

	$N_{pilots} = 6$						$N_{pilots} = 8$							
Bit #	0	1	2	3	4	5	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	0
2	1	1	0	1	1	1	1	1	1	0	1	1	1	1
3	1	0	0	1	1	0	1	0	1	0	1	1	1	0
4	1	1	0	1	1	1	1	1	1	0	1	1	1	1
5	1	1	1	1	1	0	1	1	1	1	1	1	1	0
6	1	1	0	1	0	0	1	1	1	0	1	0	1	0
7	1	1	1	1	1	0	1	1	1	1	1	1	1	0
8	1	1	0	1	1	1	1	1	1	0	1	1	1	1
9	1	0	0	1	0	1	1	0	1	0	1	0	1	1
10	1	0	1	1	0	0	1	0	1	1	1	0	1	0
11	1	1	1	1	0	1	1	1	1	1	1	0	1	1
12	1	0	1	1	0	0	1	0	1	1	1	0	1	0
13	1	0	0	1	0	1	1	0	1	0	1	0	1	1
14	1	0	1	1	1	1	1	0	1	1	1	1	1	1
15	1	0	0	1	0	1	1	0	1	0	1	0	1	1
16	1	0	1	1	0	0	1	0	1	1	1	0	1	0

FIG. 20C

$N_{pilots}$	Pilot bit position #	Corresponding word of length 16
6	1	$C_1$
	2	$C_2$
	4	$C_3$
	5	$C_4$
8	1	$C_1$
	3	$C_2$
	5	$C_3$
	7	$C_4$

FIG. 20D

Symbol rate	8ksps		16,32,64,128ksps				256,512,1024ksps							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot # 1	11	11	11	11	11	10	11	11	11	10	11	00	11	01
2	11	10	11	10	11	11	11	10	11	11	11	00	11	10
3	11	00	11	00	11	10	11	00	11	10	11	11	11	11
4	11	10	11	10	11	11	11	10	11	11	11	10	11	11
5	11	11	11	11	11	10	11	11	11	10	11	10	11	01
6	11	10	11	10	11	00	11	10	11	00	11	01	11	00
7	11	11	11	11	11	10	11	11	11	10	11	10	11	01
8	11	10	11	10	11	11	11	10	11	11	11	11	11	00
9	11	00	11	00	11	01	11	00	11	01	11	11	11	10
10	11	01	11	01	11	00	11	01	11	00	11	11	11	01
11	11	11	11	11	11	01	11	11	11	01	11	00	11	00
12	11	01	11	01	11	00	11	01	11	00	11	01	11	00
13	11	00	11	00	11	01	11	00	11	01	11	01	11	10
14	11	01	11	01	11	11	11	01	11	11	11	10	11	11
15	11	00	11	00	11	01	11	00	11	01	11	01	11	10
16	11	01	11	01	11	00	11	01	11	00	11	00	11	11

FIG. 20E

Symbol rate	2048,4096ksps															
Symbol #	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Slot # 1	11	11	11	10	11	00	11	01	11	00	11	11	11	01	11	01
2	11	10	11	11	11	00	11	10	11	00	11	10	11	10	11	00
3	11	00	11	10	11	11	11	11	11	11	11	01	11	00	11	00
4	11	10	11	11	11	10	11	11	11	10	11	01	11	00	11	01
5	11	11	11	10	11	10	11	01	11	01	11	01	11	01	11	10
6	11	10	11	00	11	01	11	00	11	10	11	00	11	00	11	00
7	11	11	11	10	11	10	11	01	11	10	11	00	11	10	11	00
8	11	10	11	11	11	11	11	00	11	11	11	11	11	11	11	01
9	11	00	11	01	11	11	11	10	11	11	11	00	11	10	11	10
10	11	01	11	00	11	11	11	01	11	11	11	01	11	01	11	11
11	11	11	11	01	11	00	11	00	11	00	11	10	11	11	11	11
12	11	01	11	00	11	01	11	00	11	01	11	10	11	11	11	10
13	11	00	11	01	11	01	11	10	11	10	11	10	11	10	11	01
14	11	01	11	11	11	10	11	11	11	01	11	11	11	11	11	11
15	11	00	11	01	11	01	11	10	11	01	11	11	11	01	11	11
16	11	01	11	00	11	00	11	11	11	00	11	00	11	00	11	10

FIG 20F

Symbol rate	Symbol #	Channel	Corresponding word : of length 16
8ksps	1	I-CH	C <sub>1</sub>
		Q-CH	C <sub>2</sub>
16, 32, 64, 128ksps	1	I-CH	C <sub>1</sub>
		Q-CH	C <sub>2</sub>
	3	I-CH	C <sub>3</sub>
		Q-CH	C <sub>4</sub>
256, 512, 1024ksps	1	I-CH	C <sub>1</sub>
		Q-CH	C <sub>2</sub>
	3	I-CH	C <sub>3</sub>
		Q-CH	C <sub>4</sub>
	5	I-CH	C <sub>5</sub>
		Q-CH	C <sub>6</sub>
	7	I-CH	C <sub>7</sub>
		Q-CH	C <sub>8</sub>
2048, 4096ksps	1	I-CH	C <sub>1</sub>
		Q-CH	C <sub>2</sub>
	3	I-CH	C <sub>3</sub>
		Q-CH	C <sub>4</sub>
	5	I-CH	C <sub>5</sub>
		Q-CH	C <sub>6</sub>
	7	I-CH	C <sub>7</sub>
		Q-CH	C <sub>8</sub>
	9	I-CH	C <sub>9</sub>
		Q-CH	C <sub>10</sub>
	11	I-CH	C <sub>11</sub>
		Q-CH	C <sub>12</sub>
	13	I-CH	C <sub>13</sub>
		Q-CH	C <sub>14</sub>
	15	I-CH	C <sub>15</sub>
		Q-CH	C <sub>16</sub>

FIG. 20G



Symbol #	0	1	2	3
Slot #1	11	11	11	10
2	11	10	11	11
3	11	00	11	10
4	11	10	11	11
5	11	11	11	10
6	11	10	11	00
7	11	11	11	10
8	11	10	11	11
9	11	00	11	01
10	11	01	11	00
11	11	11	11	01
12	11	01	11	00
13	11	00	11	01
14	11	01	11	11
15	11	00	11	01
16	11	01	11	00

FIG. 20H

Symbol #	Channel	Corresponding word of length 16
1	I-CH	C <sub>1</sub>
	Q-CH	C <sub>2</sub>
3	I-CH	C <sub>3</sub>
	Q-CH	C <sub>4</sub>

FIG. 20I

Frame Synchronization Words															
L=15, Slot No.	1	2	3	4	.....	15									
$C_1 = (1\ 0\ 0\ 0\ 1\ 1\ 1\ 1\ 0\ 1\ 0\ 1\ 1\ 0\ 0)$															
$C_2 = (1\ 0\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 0)$															
$C_3 = (1\ 1\ 0\ 0\ 0\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 1\ 1)$															
$C_4 = (0\ 0\ 1\ 0\ 1\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 1\ 1)$															
$C_5 = (1\ 1\ 1\ 0\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0\ 0\ 0\ 1)$															
$C_6 = (1\ 1\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0\ 1\ 0\ 0)$															
$C_7 = (1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 1\ 1\ 1\ 1\ 0\ 0\ 0)$															
$C_8 = (0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0\ 1)$															

FIG. 21

FIG. 22A

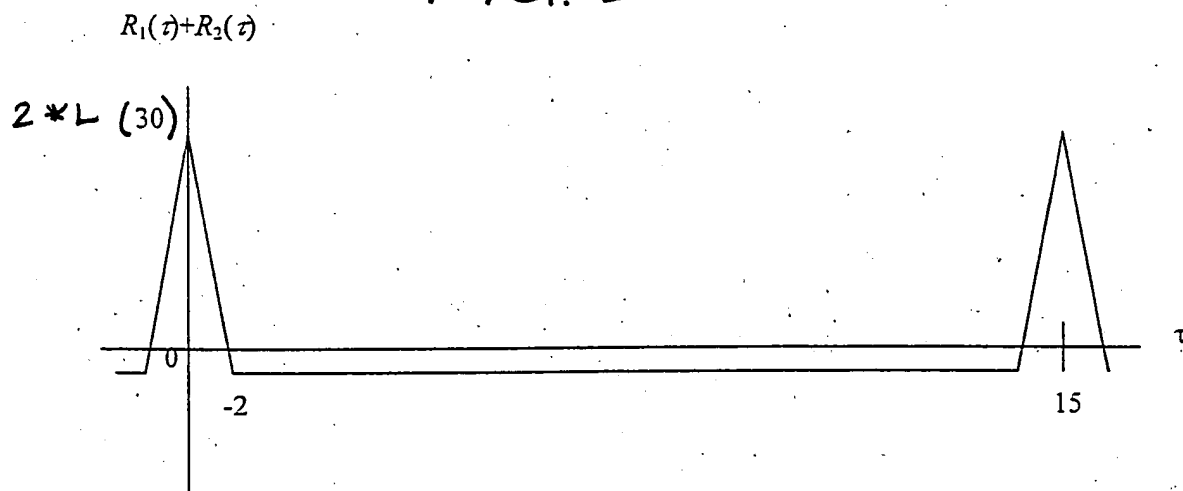
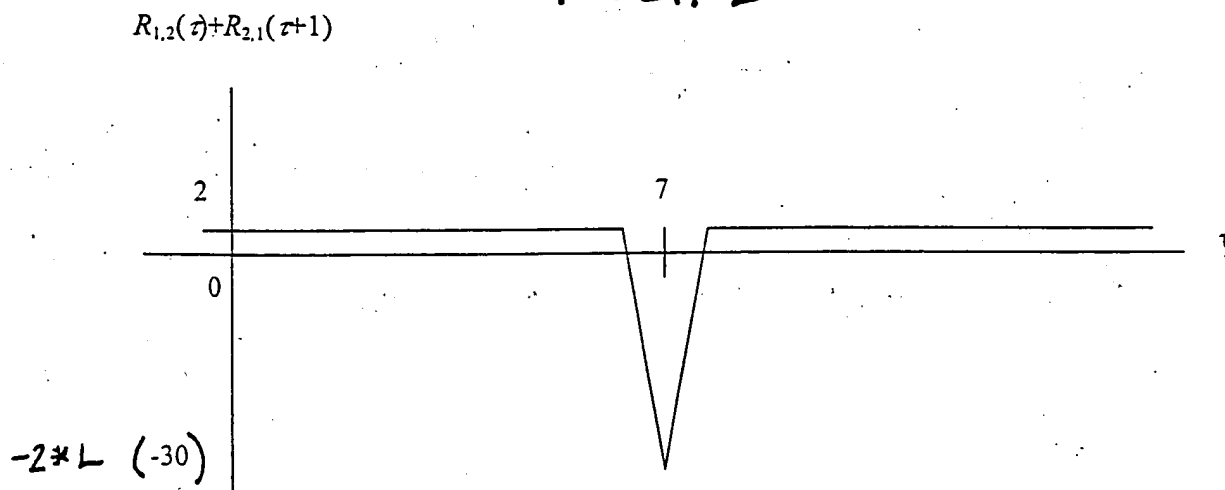


FIG. 22B



$$R_1(\tau) + R_2(\tau) + R_3(\tau) + R_4(\tau)$$

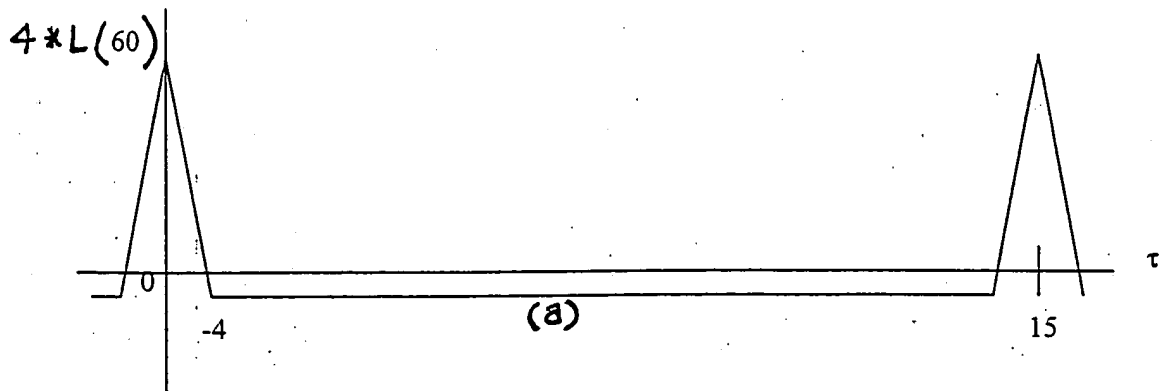


FIG. 22C

$$R_{1,2}(\tau) + R_{2,1}(\tau+1) + R_{3,4}(\tau) + R_{4,3}(\tau+1)$$

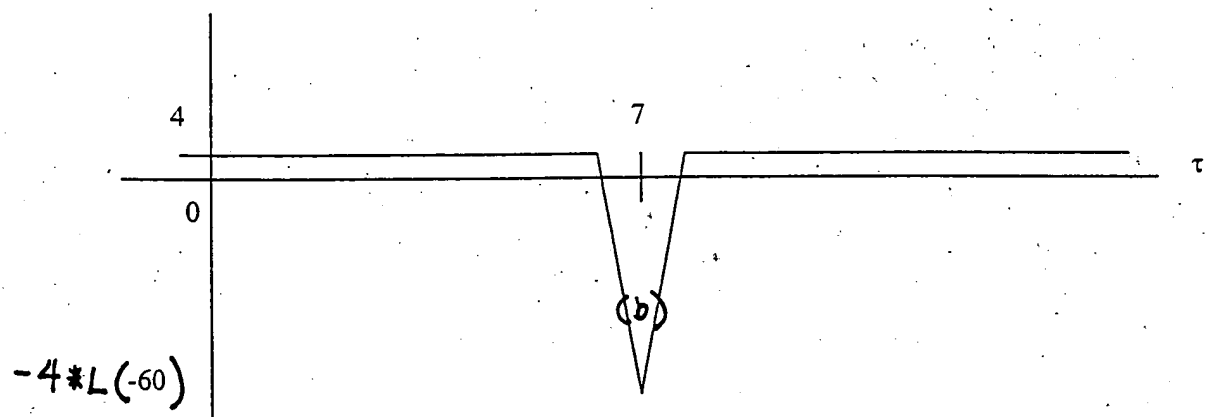


FIG. 22D

Bit #	$N_{\text{pilot}}=2$		$N_{\text{pilot}}=3$			$N_{\text{pilot}}=4$			
	0	1	0	1	2	0	1	2	3
Slot #1	1	1	1	1	1	1	1	1	1
2	0	0	0	1	0	1	0	1	0
3	0	1	0	1	1	1	0	1	1
4	0	0	0	1	0	1	0	1	0
5	1	0	1	1	0	1	1	1	0
6	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1
8	1	0	1	1	0	1	1	1	0
9	0	1	0	1	1	1	0	1	1
10	1	1	1	1	1	1	1	1	1
11	0	1	0	1	1	1	0	1	1
12	1	0	1	1	0	1	1	1	0
13	1	0	1	1	0	1	1	1	0
14	0	0	0	1	0	1	0	1	0
15	0	0	0	1	0	1	0	1	0

FIG. 23A

$N_{\text{pilot}}$	Pilot bit position #	Corresponding word of length 15
2	0	$C_1$
	1	$C_2$
3	0	$C_1$
	2	$C_2$
4	1	$C_1$
	3	$C_2$

FIG. 23B

FIG. 23C

Bit #	$N_{\text{pilot}}=2$		$N_{\text{pilot}}=3$			$N_{\text{pilot}}=4$			
	0	1	0	1	2	0	1	2	3
Slot #1	1	1	1	1	1	1	1	1	1
2	1	0	0	1	0	1	0	1	0
3	1	1	0	1	1	1	0	1	1
4	1	0	0	1	0	1	0	1	0
5	1	0	1	1	0	1	1	1	0
6	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1
8	1	0	1	1	0	1	1	1	0
9	1	1	0	1	1	1	0	1	1
10	1	1	1	1	1	1	1	1	1
11	1	1	0	1	1	1	0	1	1
12	1	0	1	1	0	1	1	1	0
13	1	0	1	1	0	1	1	1	0
14	1	0	0	1	0	1	0	1	0
15	1	0	0	1	0	1	0	1	0

$N_{\text{pilot}}$	Pilot bit position #	Corresponding word of length 15
2	1	$C_1$
3	0	$C_1$
	2	$C_2$
4	1	$C_1$
	3	$C_2$

FIG. 23D

FIG. 23E

	$N_{\text{pilot}} = 5$					$N_{\text{pilot}} = 6$					
Bit #	0	1	2	3	4	0	1	2	3	4	5
Slot #1	1	1	1	1	0	1	1	1	1	1	0
2	0	0	1	1	0	1	0	0	1	1	0
3	0	1	1	0	1	1	0	1	1	0	1
4	0	0	1	0	0	1	0	0	1	0	0
5	1	0	1	0	1	1	1	0	1	0	1
6	1	1	1	1	0	1	1	1	1	1	0
7	1	1	1	0	0	1	1	1	1	0	0
8	1	0	1	0	0	1	1	0	1	0	0
9	0	1	1	1	0	1	0	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1
11	0	1	1	0	1	1	0	1	1	0	1
12	1	0	1	1	1	1	1	0	1	1	1
13	1	0	1	0	0	1	1	0	1	0	0
14	0	0	1	1	1	1	0	0	1	1	1
15	0	0	1	1	1	1	0	0	1	1	1

	$N_{\text{pilot}} = 7$							$N_{\text{pilot}} = 8$							
Bit #	0	1	2	3	4	5	6	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
2	1	0	0	1	1	0	1	1	0	1	0	1	1	1	0
3	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1
4	1	0	0	1	0	0	1	1	0	1	0	1	0	1	0
5	1	1	0	1	0	1	1	1	1	1	0	1	0	1	1
6	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
7	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0
8	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
9	1	0	1	1	1	0	1	1	0	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	1	0	1	1	0	1	1	1	0	1	1	1	0	1	1
12	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1
13	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0
14	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1
15	1	0	0	1	1	1	1	1	0	1	0	1	1	1	1

FIG. 23F

$N_{\text{pilot}}$	Pilot bit position #	Corresponding word of length 15
5	0	$C_1$
	1	$C_2$
	3	$C_3$
	4	$C_4$
6	1	$C_1$
	2	$C_2$
	4	$C_3$
	5	$C_4$
7	1	$C_1$
	2	$C_2$
	4	$C_3$
	5	$C_4$
8	1	$C_1$
	3	$C_2$
	5	$C_3$
	7	$C_4$

FIG. 23G

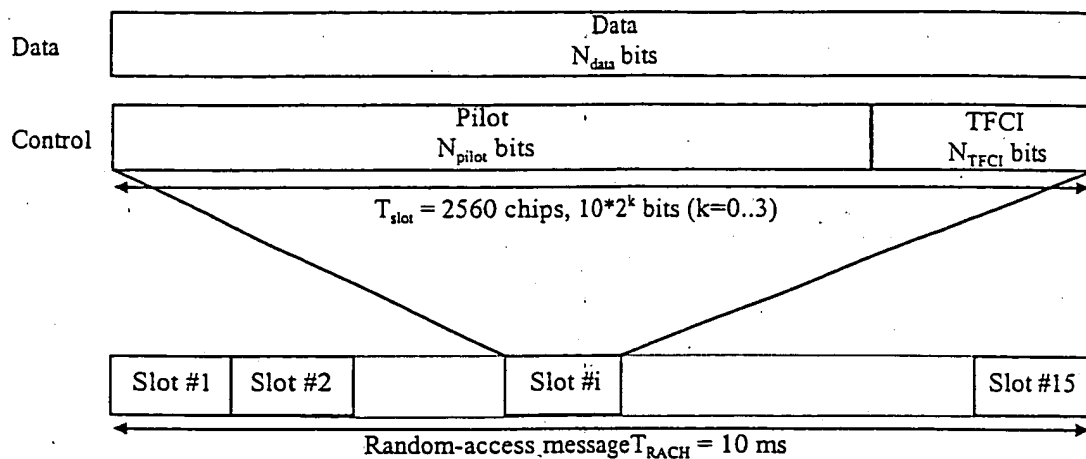


FIG. 23H

FIG. 23I

Channel Rate (kbps)	Bit	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	$N_{pilot}$	$N_{TFCI}$
15		15	256	150	10	8	2

FIG. 23J

Bit #	0	1	2	3	4	5	6	7
Slot #1	1	1	1	1	1	1	1	0
2	1	0	1	0	1	1	1	0
3	1	0	1	1	1	0	1	1
4	1	0	1	0	1	0	1	0
5	1	1	1	0	1	0	1	1
6	1	1	1	1	1	1	1	0
7	1	1	1	1	1	0	1	0
8	1	1	1	0	1	0	1	0
9	1	0	1	1	1	1	1	0
10	1	1	1	1	1	1	1	1
11	1	0	1	1	1	0	1	1
12	1	1	1	0	1	1	1	1
13	1	1	1	0	1	0	1	0
14	1	0	1	0	1	1	1	1
15	1	0	1	0	1	1	1	1



	$N_{\text{pilot}}=2$		$N_{\text{pilot}}=4$		$N_{\text{pilot}}=8$				$N_{\text{pilot}}=16$							
Symbol #	0		0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11		11	11	11	11	11	10	11	11	11	10	11	11	11	10
2	00		11	00	11	00	11	10	11	00	11	10	11	11	11	00
3	01		11	01	11	01	11	01	11	01	11	01	11	10	11	00
4	00		11	00	11	00	11	00	11	00	11	00	11	01	11	10
5	10		11	10	11	10	11	01	11	10	11	01	11	11	11	11
6	11		11	11	11	11	11	10	11	11	11	10	11	01	11	01
7	11		11	11	11	11	11	00	11	11	11	00	11	10	11	11
8	10		11	10	11	10	11	00	11	10	11	00	11	10	11	00
9	01		11	01	11	01	11	10	11	01	11	10	11	00	11	11
10	11		11	11	11	11	11	11	11	11	11	11	11	00	11	11
11	01		11	01	11	01	11	01	11	01	11	01	11	11	11	10
12	10		11	10	11	10	11	11	11	10	11	11	11	00	11	10
13	10		11	10	11	10	11	00	11	10	11	00	11	01	11	01
14	00		11	00	11	00	11	11	11	00	11	11	11	00	11	00
15	00		11	00	11	00	11	11	11	00	11	11	11	10	11	01

FIG. 24A

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}} = 2$	0	I-CH	$C_1$
		Q-CH	$C_2$
$N_{\text{pilot}} = 4$	1	I-CH	$C_1$
		Q-CH	$C_2$
$N_{\text{pilot}} = 8$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
$N_{\text{pilot}} = 16$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
	5	I-CH	$C_5$
		Q-CH	$C_6$
	7	I-CH	$C_7$
		Q-CH	$C_8$

FIG. 24B

	$N_{\text{pilot}} = 4$		$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	01	10	11	00	00	10	11	00	00	10	11	00	00	10
2	10	10	11	00	00	01	11	00	00	01	11	10	00	10
3	11	10	11	11	00	00	11	11	00	00	11	10	00	11
4	10	10	11	10	00	01	11	10	00	01	11	00	00	00
5	00	10	11	11	00	11	11	11	00	11	11	01	00	10
6	01	10	11	00	00	10	11	00	00	10	11	11	00	00
7	01	10	11	10	00	10	11	10	00	10	11	01	00	11
8	00	10	11	10	00	11	11	10	00	11	11	10	00	11
9	11	10	11	00	00	00	11	00	00	00	11	01	00	01
10	01	10	11	01	00	10	11	01	00	10	11	01	00	01
11	11	10	11	11	00	00	11	11	00	00	11	00	00	10
12	00	10	11	01	00	11	11	01	00	11	11	00	00	01
13	00	10	11	10	00	11	11	10	00	11	11	11	00	00
14	10	10	11	01	00	01	11	01	00	01	11	10	00	01
15	10	10	11	01	00	01	11	01	00	01	11	11	00	11

FIG. 24C

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}} = 4$	0	I-CH	$-C_1$
		Q-CH	$C_2$
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	$C_8$
	7	I-CH	$C_5$
		Q-CH	$-C_6$

FIG. 24D

Symbol #	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	11	11	10	11	11	11	10	11	11	11	10
2	11	00	11	10	11	00	11	10	11	11	11	00
3	11	01	11	01	11	01	11	01	11	10	11	00
4	11	00	11	00	11	00	11	00	11	01	11	10
5	11	10	11	01	11	10	11	01	11	11	11	11
6	11	11	11	10	11	11	11	10	11	01	11	01
7	11	11	11	00	11	11	11	00	11	10	11	11
8	11	10	11	00	11	10	11	00	11	10	11	00
9	11	01	11	10	11	01	11	10	11	00	11	11
10	11	11	11	11	11	11	11	11	11	00	11	11
11	11	01	11	01	11	01	11	01	11	11	11	10
12	11	10	11	11	11	10	11	11	11	00	11	10
13	11	10	11	00	11	10	11	00	11	01	11	01
14	11	00	11	11	11	00	11	11	11	00	11	00
15	11	00	11	11	11	00	11	11	11	10	11	01

FIG. 25A

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}} = 8$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
$N_{\text{pilot}} = 16$	1	I-CH	$C_1$
		Q-CH	$C_2$
	3	I-CH	$C_3$
		Q-CH	$C_4$
	5	I-CH	$C_5$
		Q-CH	$C_6$
	7	I-CH	$C_7$
		Q-CH	$C_8$

FIG. 25B

	$N_{\text{pilot}} = 8$				$N_{\text{pilot}} = 16$							
Symbol #	0	1	2	3	0	1	2	3	4	5	6	7
Slot #1	11	00	00	10	11	00	00	10	11	00	00	10
2	11	00	00	01	11	00	00	01	11	10	00	10
3	11	11	00	00	11	11	00	00	11	10	00	11
4	11	10	00	01	11	10	00	01	11	00	00	00
5	11	11	00	11	11	11	00	11	11	01	00	10
6	11	00	00	10	11	00	00	10	11	11	00	00
7	11	10	00	10	11	10	00	10	11	01	00	11
8	11	10	00	11	11	10	00	11	11	10	00	11
9	11	00	00	00	11	00	00	00	11	01	00	01
10	11	01	00	10	11	01	00	10	11	01	00	01
11	11	11	00	00	11	11	00	00	11	00	00	10
12	11	01	00	11	11	01	00	11	11	00	00	01
13	11	10	00	11	11	10	00	11	11	11	00	00
14	11	01	00	01	11	01	00	01	11	10	00	01
15	11	01	00	01	11	01	00	01	11	11	00	11

FIG. 25C

Symbol rate	Symbol #	Channel	Corresponding word of length 15
$N_{\text{pilot}} = 8$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
$N_{\text{pilot}} = 16$	1	I-CH	$-C_3$
		Q-CH	$C_4$
	3	I-CH	$C_1$
		Q-CH	$-C_2$
	5	I-CH	$-C_7$
		Q-CH	$C_8$
	7	I-CH	$C_5$
		Q-CH	$-C_6$

FIG. 25D

Parameters	Uplink
Number of slots per frame	15
Number of bits in the DPCCH (Pilot/TPC/TFCI/FBI)	6/2/2/0
Number of bits in the DPDCH per each slot	10
Spreading factor (DPDCH)	256
Spreading factor (DPCCH)	256
Modulation	HPSK
3dB bandwidth	3.84MHz
Shaping filter	Root raised cosine (roll off 0.22)
Power amplifier	Ideal
Propagation channel	AWGN

FIG. 26A

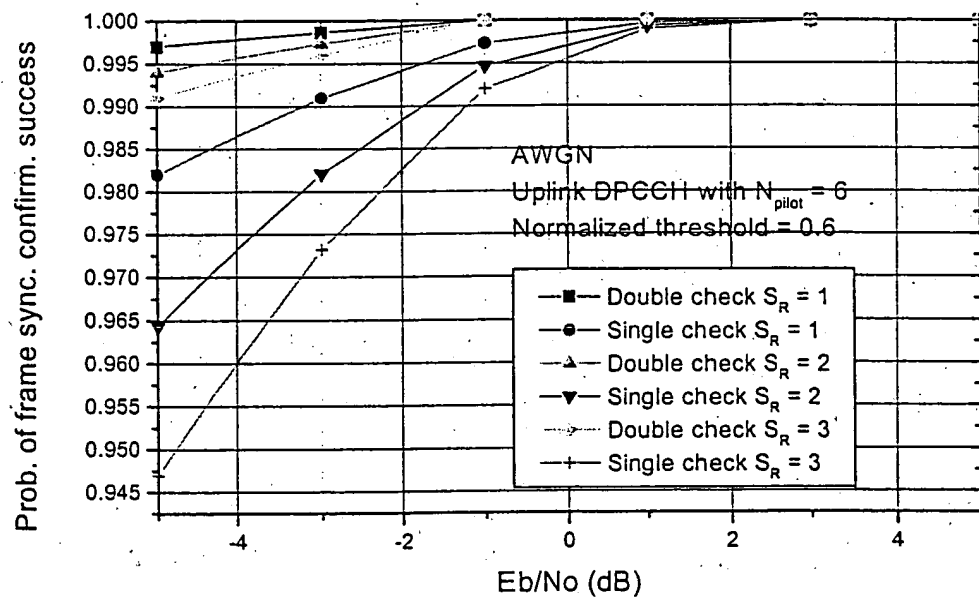


FIG. 26B

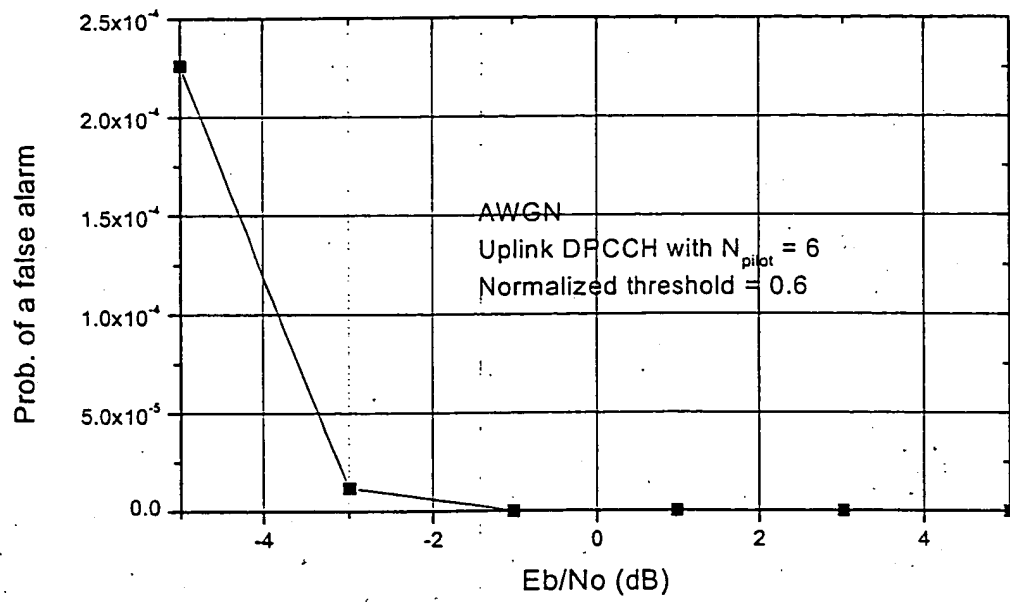


FIG. 26C

FIG. 27

Item	15 slots	16 slots
No. of slots per frame	15	16
No. of $N_{\text{pilot}}$ per slot	1) Uplink 2, 3, 4, 5, 6, 7, 8 2) Downlink 2, 4, 8, 16	1) Uplink 5, 6, 7, 8 2) Downlink 4, 8, 16, 32
Slot-Slot possible ?	Yes	Yes
Double-check possible?	Yes (Two correlators such as auto-correlator and cross-correlator are used)	Yes (Auto-correlator)
Single frame synchronization word can be used for frame synchronization ?	Yes since a frame synchronization word has -1 out-of-phase coefficients.	May not be feasible because of +4 or -4 out-of-phase coefficients. The +4 or -4 side lobes can be zero through some particular processing using preferred pair of frame synchronization words.
Frame synchronization words	All 8 frame synchronization words are made out of a single PN code	All 8 frame synchronization words have +4 or -4 out-of-phase coefficient and minus peak value at middle shift.
Autocorrelation function	$R(\tau)=15, \tau=0$ $R(\tau)=-1, \text{ elsewhere}$	$R(\tau)=16, \tau=0$ $R(\tau)=-16, \tau=8$ $R(\tau)=0, +4, \text{ or } -4, \text{ elsewhere}$